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Monetary Approach to Balance of Payments: The Nigerian Experience

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***Abstract**: Balance of Payments disequilibrium has a fundamental impact on the economy of most of the developing countries including Nigeria. According to the monetarists balance of payments disequilibrium is a reflection of disequilibrium in the money market. In the case of Nigeria, the continuous reliance on oil as a major export has been the country major undoing because the price of oil depends on the whims and caprices of the international market. The purpose of this study is to investigate how monetary instruments can be applied in settling the problem of balance of payments in Nigeria. Ordinary Least Squares (OLS) econometric technique was used to analyze the data. The data was first examined for unit roots using the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. A co-integration regression was then used to examine the long run relationship among the variables. The short-run Vector Error Correction model was also used to determine the speed of the adjustment to equilibrium. The results show that, domestic credit, interest rate, exchange rate and real gross domestic product contributed 66 per cent to changes in balance of payments. Finally, exchange rate, gross domestic product and domestic credit have significant and positive effect on Nigeria's balance of payments. Hence, the Nigerian government can maintain equilibrium in the balance of payments through their control on these variables.*

***Keywords:** Monetary approach to balance of payments, balance of payments, and economic growth.*

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1.0 Introduction

Macroeconomic problems and financial management in Nigeria is complicated by balance of payments instability attributable mostly to its oil dominated export earnings. According to King (2003), Nigeria fundamental or underlying current account balance is a function of three major determinants: Oil exports priced at a sustainable long-term trend value, the competitiveness of its oil exports, and the pace of remittance from Nigerians living abroad.

In the short term, the Nigerian balance of payments is subject to a high degree of variability caused by changing in government spending, which often creates surges in import payments for capital projects, changes in the prices of oil and changes in capital flight caused by periodic exchange rate uncertainty. This assessment is predicated by the dynamic of balance of payments right from 1970.

Over the last three decades, there had been growing trend in the fluctuations of the Nigeria's balance of payments. Balance of payments crisis distorts the working of the entire system because it creates disequilibrium between the supply and demand for money (Nwani, 2003). According to the monetarists balance of payments disequilibrium is a reflection of disequilibrium in the money market. From 1970-1975 the Nigerian economy witnessed a positive balance of payments, this of course was largely due to the oil boom of the 70s, sooner there was oil glut in the international market. It leads to drastic cut in oil prices hence reduces the export of oil, therefore, the balance of payments showed negative balance for quite sometime.

The different economic measures put in place by various governments in the 1980s could not turn around the ugly nature of the balance of payments. For example, the Nigerian export promotion policy, import substitution industrialization, exchange rate policy and lately structural adjustment programme (SAP). The worst of all is the transitional period of democracy (1999-2010), balance of payments continued to showed red, though the government have tried to change the course of the balance of payments., but up till date there is still no improvement, probably is as a result of the angle (supply side) the government have been concentrating, this research work has given us a new leeway to the understanding and possible correction of the balance of payments in Nigeria.

1.1 Historical perspectives of balance of payments in Nigeria

Since independence, the Nigerian economy has been experiencing balance of payments deficits. For example, the balance of payments had a surplus during the periods 1970 – 1975, 1978 – 1980, 1994 – 1995, 1997, 2001 – 2002 and 2004, respectively, the rest of the years showed that, the balance of payments was in deficits. The surplus experienced in the early 1970s (1970 – 1975) of course was due largely to the increase in the earnings from petroleum exports, and the substantial inflow of private capital and official receipts from abroad.

In 1978 to 1980 there was a surplus of ₦1,293.6M, ₦1,869.9M and ₦2, 402.2M respectively, in the balance of payments. This was as a result of increase in the sales of oil and the adoption of import restraining measures.

Before 1985 there were deficits in both the current account and the overall balance of payments because of the relaxation of import controls, which led to the increase in the importation of capital goods, raw materials, etc. During the Buhari-Idiagbon regime, stringent measures were re-introduced to control imports. For example, the promulgation of National Economic Emergency Degree in 1985 and outright banned of the importation of some commodities, this led to surplus in 1984-1985. Since then and throughout the 1990s except in 1997 there was an endemic balance of payments deficit. Despite the implementation of Structural Adjustment Programme, and other interventionist policies like the introduction of Second-tier Foreign Exchange Market (SFEM) to make import costly; increase in the export of oil as a result of the 1991 Gulf War, and debt service deferment, the balance of payments could not recovered.

The balance of payments deteriorated in 1986, and worsened with double-digit deficits in the 1990s. In some cases the balance of payments was in triple digits like in 1992 (₦101, 404.9M). The factors identified as the cornerstone in these persistent deficits include: expansionary monetary and fiscal policies, worsening terms of trade, over-valuation of the official exchange rate, etc.

The period 2002 to 2008 saw a worsening period of our worsening balance of payments, within this period, the balance of payments continued to be in a deficit. It has been observed that, the deficit was due to the increase in the level of imports of goods and services required to bridge the supply shortage, as well as to finance the expanded economic activities.

It is evident that, the various policy measures adopted at different times to improve the balance of payments position were ineffective. It was observed by Ogun, 1985; Ajakaiye, 1985, Ndebbio and Ekpo, 1985 that, the devaluation of the currency, exchange rate flexibility, regulation of imported goods, increase in the tariff on some imported goods and the overall Structural Adjustment Programme, etc were largely insensitive to a positive balance of payments adjustment.

The balance of payments problems have been traced to the hostile international financial and economic environment (resulting in the perpetuation of Nigeria's depending on its oil export and the low value of its commodity terms of trade, huge debt overhang, increase in monetary and fiscal policies, exchange rate variation, inflationary pressures, depreciation of major foreign currencies, slump in oil prices and general inconsistency in macroeconomic policies.

This paper therefore examines monetary approach to balance of payments in Nigeria. The paper is structured as followed. After the introduction, section 2 presents the theoretical framework and literature review. Section 3 shows the working data, model specification and the methodology. Section 4 presents and analyzes the empirical results. Finally, section 5 states the policy implications of the MABP in Nigeria and the conclusion.

2.0 Theoretical framework and literature review

The monetary approach to balance of payments emanated from the David Hume price-specie-flow mechanism, which was launched as a counter-argument to the mercantilist belief, that a country can achieve a balance of payments surplus by import-substitution and export-promotion policies. The monetary approach is a "monetary phenomenon" which expresses the relationship between a country's balance of payments, its money supply (Chacholiades, 1990), and/or exchange rate and the demand for money (Nyong, 2005).

According to the monetarists, disequilibrium in the balance of payments is caused by the gap between the demand for, and supply for money, which may lead to surpluses or deficits in the balance of payments. Deficits are caused by money supply exceeding money demand, which may be financed by reserve outflow, while surpluses are caused by money demand exceeding money supply. This is reflected by a substantial size of international reserves (Howard and Mamingi, (2002), Nyong, (2005).

The MABP emphasizes the monetary implications of balance of payments disequilibrium. In terms of prices, the MABP regards the general price level as the determinant of the real value of nominal assets, money and international debt. Relative prices play a secondary role as they are considered to have only a transitory effect on the balance of payments (Fleermuys, 2005).

MABP links any existing disequilibrium in the balance of payments with the expansion in domestic credit. However it predicts that reserve growth is positively related to the growth of domestic income and negatively correlated with the rate of domestic credit expansion. The MABP is anchored under the following assumptions:

- Fixed exchange rate regime with the rest of the world (purchasing power parity).
- The existence of a stable demand for money function.
- Prices are flexible and markets operate perfectly.
- Instantaneous adjustment of money supply to demand for it.

The foundation of the Monetary Approach to balance of payments is the demand for money function, which is assumed to be a stable function of a few variables. It is a long-run phenomenon (Nyong, 2005). The MABP specifies three main building blocs: the money supply identity; the money demand identity, and an equilibrium condition. The model consists of the following equations:

$$Ms = mH \quad (1)$$

$$Ms = (R + D) \quad (2)$$

Where: Ms = Money supply, mH = High powered money or monetary base, m = Base money multiplier, R = International reserves, D = Domestic credit

Equation (1) and (2) states that, the supply of money (Ms) is a function of high powered money or monetary base (H) separated into domestic credit (D) and international reserves (R).

$$M^d = f(Y, P, T) \qquad (3)$$

Where: M^d = Money demand, Y = Level of real domestic income, P = price level, I = Rate of interest

Equation (3) says, the demand for money function (M^d) is a function of real income (Y), domestic price level (P) and interest rate (I). The monetary theory holds that, there is a positive relationship between money demand and income ($M^d/Y > 0$), and between money demand and the price level ($M^d/P > 0$).

However, Hume, who was concerned with the inflow and outflow of gold from a country, demonstrated that an increase in exports would lead to increases in domestic prices as gold entered a country and thus, reduces demand for domestic goods. This leads to rising import demand and automatically limits the amount by which exports would exceed imports. (Dhliwayo, 1996), and (Du Plessis, et al 1998).

In other words, a rise in real income (Y) will lead to an increase in the transactions and precautionary demand for money and hence an increase in the demand for money. An increase in the domestic price level will reduce real money balance (M/P), and since it is assumed that, there is a constant demand for real money balance, this will lead to a compensating increase in nominal money balances, all things being equal.

Furthermore, there is a negative relationship between money demand and the interest rate ($M^d/I < 0$). If interest rates are increased, people will demand less money as the opportunity cost of holding cash balances is increased, thus creating incentives for investing in interest–bearing securities.

Equilibrium in the money market is stated as follows:

$$Ms = Md \qquad (4)$$

Collapsing equation (1), (2) and (3), we obtain thus:

$$MD + MR = f(Y, P, I) \qquad (5)$$

$$M(D + R) = Ya_1, Pa_2, Ia_3 \qquad (6)$$

Taking the logs, we obtain:

$$Logm + \log (D + R) = Logm + a_1 \log Y + a_2 \log P + a_3 \log I \qquad (7)$$

$$Log (D + R) = \log m + a_1 \log Y + a_2 \log P + a_3 \log I \qquad (8)$$

Differentiating with respect to time, we obtain

$$\Delta R = \Delta M + a_1\Delta Y + a_2\Delta P + a_3\Delta I – a_4\Delta D \qquad (9)$$

D+R = M Y P I D+R

But since R = BOP and D + R + Ms (money supply if M = 1), we obtain:

$$BOP = b_0\Delta Y + b_1\Delta P + b_2\Delta I + b_3\Delta D \quad (10)$$

Ms Y P I Ms

Equation 10 shows that changes in balance of payments are influenced by national income, the price level or the exchange rate, and the domestic components of high powered money (monetary base). If we assume that the economy is operating at full employment, then Y = 0. However, if we assume that, the exchange rate is fixed and foreign price level is given, then the purchasing power parity assumption ensures that p = 0. From the equation, the only source of variation in balance of payments is domestic credit creation

We can also assume the reserve flow equation by collapsing equation (2), (3) and (4) combined, placing the variables in percentage changes and isolating reserves as the independent variable, we have:

$$R + D = f(y, P, I)$$

$$\Delta R + \Delta D = \Delta Y + \Delta P + \Delta I$$

R D Y P I

$$\Delta R = \Delta Y + \Delta P + \Delta I - \Delta D \quad (11)$$

R Y P I D

Equation (11) is the basic equation of the MABP, which states that, the balance of payments is the result of divergence between the growth of money demand and the growth of domestic credit, while the consequences of MABP brings the money market into equilibrium. With a stable money demand, an increase in domestic credit will cause an equal and opposite change in international reserves.

The co-efficient of D is, therefore, known as offset co-efficient. It shows the extent to which changes in domestic credit are offset by changes in international reserves. The MABP envisages a value of minus unity for this co-efficient in the reserve flow equation (Dhliwayo, (1996), Fleermuys, (1995).

The MABP stipulates that balance of payments deficits result in decreases in the money supply as a consequence of a loss in international reserves. Many developing economies experience persistent deficits in their balance of payments because authorities use "credit policies and expenditure policies to maintain the level of output and employment" (Howard and Maming, 2002).

The MABP regards money demand as a demand for a stock; therefore, the inflows or outflows of money are regarded as the equilibrium between desired and actual stocks, which can be adjusted through an excess of income over expenditure or vice versa. The differences between income and expenditure will be corrected when the flow of money brings the desired and actual money stock back into equilibrium, monetary authorities only have an influence over the flow on money supply.

Since the authorities do not have control over the stock on money supply, it is assumed that, in the case of countries with fixed exchange rates, money supply is endogenous. Monetary policies only have an influence on the balance of payments through its control over credit creation. In the developed demand-determined economies, where money supply is credit-driven and loans make deposits; this argument has gained laudable ground, especially as the banking system of countries develop.

Generally, the main hypothesis, which MABP attempts to test, is that the reserve growth and the balance of payments are positively related to domestic economic growth and the income elasticity of demand for money, and negatively related to the domestic credit expansion. The process of restoring equilibrium between the demand for money and the available stock of money balances can under the monetary approach paradigm be achieved without any sacrifices in the level of economic output.

In effect, prices of traded goods are given so that producers can sell as much as they produce at exogenously determined price. All that domestic demand management policy, that is, credit creation policy can do or achieve is to affect the level of domestic demand, and thus the size of the foreign trade balance (Crocketty, 1979).

Johnson, (1978) formulated a model for the monetary approach to balance of payments, which stipulates that by transferring equation (3) into rates of growth we will have:

$$\partial M^d = \partial P + ey\partial P + ei\partial i \qquad (12)$$

$$M^d \quad PY \quad i$$

Where: the parameters ey and ei denote income and interest rate elasticities of the nominal money balances. In other words, ey and ei represent the change in the demand for money with respect to the real income and nominal interest rate respectively, particularly, ey is positive while ei is negative apriori.

Similarly, since from equation (4) $Ms = M^d$, equation (2) can be rewritten as:

$$M^d = R + D \text{ or } R = M^d - D \qquad (13)$$

By changing equation (3) into rates of growth in international reserve we get the following:

$$\partial R = M - \partial M^d - D - \partial D \qquad (14)$$

$$R \quad R \quad M^d \quad R \quad D$$

Now letting the initial international reserve ratio R = R be represented

Ms M^d

as r, implying that: $\frac{D}{R} = \frac{1 - r}{r}$ that is, since

$$\frac{R}{Ms} = \frac{R}{R + D} + r, \text{ then } r(R + D) = R$$

This is equal to R (1- r) = rD. By substituting this equation and $\frac{\partial M^d}{M^d}$ in

Equation (14), we obtain:

$$\frac{\partial R}{R} = \frac{I}{r}\left[\frac{\partial P}{P} + ey\frac{\partial Y}{Y} + ei\frac{\partial I}{I} - \frac{(1- r)}{r}\frac{\partial D}{D}\right] \qquad (15)$$

Assuming constant world price and interest rates, this equation now becomes:

$$\frac{\partial R}{R} = \frac{I}{r}\, ey\frac{\partial Y}{Y} + -\frac{1- r}{r}\frac{\partial D}{D} \qquad (16)$$

Equation (15) represents the key relationship in the MABP. Under the assumed signs of the elasticities, that is, ey > 0, and ei < 0, an increase in the rate of growth in prices and real income will improve the balance of payments, whereas increase in the rates of growth in interest rates and not domestic assets in the Central Bank will lead to reserve losses (Aghevli and Klan, 1977).

Similarly, equation (16) above implies that reserve growth and the balance of payments are positively related to domestic economic growth and the income elasticity of demand for money, and negatively related to the rate of domestic credit expansion (Johnson, 1978). However, implying further by assuming no domestic economic growth (∂d/y = 0), we have

$$\frac{\partial R}{R} - \frac{1 - r}{r}\frac{\partial D}{D} \qquad (17)$$

Equation (17) states that international reserve growth and the balance of payments are inversely related to the rate of domestic credit expansion. Creennes (1984) noted that an increase in reserve ((∂R/R) in equation (15) above indicates a balance of payments surplus, and that the surplus will be greater if:

- Real income increases faster
- Domestic credit grows slower
- Nominal interest rate grows slower
- The rate of inflation rises faster

In summary, the model predicts that, economic growth will improve the overall balance of payments, since it tends to increase the demand for money vis-a-vis the domestically created supply of money. The model also shows the relationship existing between growth in money supply, prices and real income.

Another contribution made by Montiel and Haque (1986) provided a simple IMF monetary model of an open economy with a fixed exchange rate. The model is specified as follows:

$$Y = Y \quad (1)$$

$$\Delta M^d = V\Delta Y \quad (2)$$

$$\Delta Ms = \Delta M^d = V\Delta Y \quad (3)$$

$$\Delta M = \Delta R + \Delta D^p + \Delta D^g \quad (4)$$

Equation (1), the nominal gross domestic product (Y) is assumed to be exogenously determined, and in equation (2) the velocity of money is assumed to be constant with V represent an inverse of income velocity of money and the demand for money balance (M^d). Equation (3) represents the equilibrium money market, while equation (4) represents the monetary system's balance sheet constraint with R denoting international reserves while D^p and D^g stand for domestic credit to the private and public (government) sector, respectively. The variables as ex-ante or as ex-post and in either case the identities must hold (Obadan, 1996).

It should be noted however that equations (1- 4) present the balance of payments, ΔD to be expressed as a function of exogenous and policy variables, this can be done by taking the first difference in (1) and substituting successfully into equations (2), (3) and (4), where ΔM^d in equation (4) is now interpreted as the flow of money supply. The resulting equation gives the fundamental equation of the monetary approach to the balance of payments, thus:

$$\Delta R = V\Delta Y - \Delta D \quad (5)$$

where the (^) over the domestic credit ($D^p + D^g$) is identified as a policy variable controlled by the monetary authorities. In this model, an increase in domestic credit will be offset by a decrease in net foreign asset (NFA) on a one-to-one basis. In order for this framework to be used for forecasting policy programmes, a desire endogenous variable ΔR, say ΔR* must be chosen and the required domestic credit expansion solved from equation (5) will be in the following form:

$$\Delta D = V\Delta Y - DR^* \quad (6)$$

Since policy is mainly interested in the resolution of balance of payments deficits as opposed to surpluses, the targeted expansion of domestic credit is set as a ceiling. However, Palak and Argry (1971) argued that, if the balance of payments has an over-riding priority, a credit ceiling would appear to be the better policy, then if strong priority is given to minimizing fluctuations in output.

In this case a credit ceiling may still be the more efficient policy where external disturbances tend to be relatively less important than domestic disturbances, particularly when an increase in expenditures will tend to worsen the balance of payments). Equation (6), therefore, provides a justification for the use of credit ceilings as a key policy instrument, and as a performance criterion in IMF stabilization policies (Obadan, 1996).

3.0 Model specification

The balance of payments equation emanated from the monetary theory of balance of payments, which has been analyzed previously. This model states that BOP is a function of exchange rate, gross domestic product, interest rate and domestic credit. The functional form can be written as follows:

$$\Delta BOP = f(\Delta LNEER, \Delta LGDP, MRR, DOC) \quad 3.1$$

Equation 3.1 can be specified further as:

$$\Delta BOP = \beta_0 + \beta_1 \Delta LNEER + \beta_2 \Delta LGDP + \beta_3 MRR + \beta_4 DOC + \mu_1 \quad 3.2$$

Where: $\beta_0 > 0$, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta 4 > 0$

f = Functional Relationship

ΔBOP = Balance of Payments

$\Delta LNEER$ = Log of Exchange Rate

$\Delta LGDP$ = Log of Gross Domestic Product

MRR = Minimum Rediscount Rate (Interest Rate)

DOC = Domestic Credit

β_0 = Constant term

β_1 - β_4 = Parameters to be estimated

μ_1 = Stochastic error term

This study adopted the Ordinary Least Squares (OLS) econometric technique. Before estimation, the stationarity of the variables were examined. Hence, a co-integration technique, and the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests were used to test for the order of integration and error correction model. We assumed a linear relationship between the dependent variable and the independent variables in the specified equation. This was done to avoid the generation of spurious results.

4.0 Presentation and analysis of result

Before estimating equation 3.2, the variables were tested using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The null hypothesis of ADF and PP tests suggest that the variables has a unit root, however, the result in table 4.1 rejects the null hypothesis under the ADF and PP. The unit root test of ADF and PP pave the way for the test of co -integration relationship among the variables using Johansen-Juselius multiple co-integration procedure, thereafter is the over-paramatized and parsimonious models, respectively.

The result in table 4.1 above shows that, BOP and DOC were stationary at levels and first difference at 5 per cent and 10 per cent level of significance, respectively. However, MRR, ΔLNEER and ΔLRGDP were stationary at first difference. Similarly, the Phillips-Perron (PP) nonparametric test shows that, MRR, ΔLNEER and ΔLRGDP are integrated of order one 1(1) while BOP and DOC are integrated of order 1(0) under ADF.

From table 4.2, trace statistic indicates 2 co-integrating equations at 5 per cent level. Equally, the maximum Eigen Value test indicates 1 co-integration equation at 5 per cent level. Since there is at least one co-integrating vector, an economic interpretation of the long run real per capita GDP can be obtained by normalizing the estimates of the unconstrained co-integrating vector on real per capita GDP

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In sum, the Johansen co-integration test indicates the existence of long run co-integrating relationship among the variables in the specified model. The identified co-integrating equation(s) can then be used as an error correction term in the Error Correction Model (ECM) in table 4.3 (see appendix)

The result of the parsimonious model as presented in table 5.4 above shows that, the coefficient of the constant term is positive and conforms to the economic apriori expectation. If all the independent variables are held constant, BOP will increase by 9747.186 per cent, though it is not statistically significant at 5 per cent level. The coefficient for lagged exchange rate is positive indicating a positive relationship with BOP. Since it is statistically significant at 5 per cent level, we can predict that, a one per cent appreciation of the exchange rate will lead to 35887.46 per cent increase in BOP. The estimated coefficient for Gross Domestic Product shows a positive sign, which conforms to the apriori economic expectation. There is therefore a positive relationship between GDP and BOP. It is statistically significant at 5 per cent level, hence we can predict that, a one per cent increase in GDP will bring about 72387.9 per cent increase in BOP. The coefficient for interest rate is negative satisfying the apriori expectation, but that of the lagged interest rate for one period has a positive sign, which disagree with economic expectation. While interest rate for the current period has an inverse relationship with BOP and is statistically significant at 5 per cent level that of the previous year has a positive relationship, though statistically insignificant at 5 per cent level. If we predict one per cent rise in interest rate at the current year, it will bring about -64828.71 per cent decrease in BOP but the same percentage prediction in the previous year brings about 69453.40 per cent increase in BOP. Estimated coefficient for Domestic Credit has a negative sign and does not agree with the apriori economic expectation; with that sign it shows that, there is an inverse relationship between DOC and BOP. It is statistically significant at 5 per cent level; however, we can predict that, a one per cent increase in DOC results to –0.309542 per cent decrease in BOP.

The speed of adjustment in the short and long equilibrium behaviour of the balance of payments and the explanatory variables are captured by the Error Correction Model (ECM). The error correction co-efficient gives us the proportion of disequilibrium errors accumulated in the previous period, which are corrected in the current period. In the parsimonious model the ECM has the correct sign and it is statistically significant at 5 per cent level. The coefficient of the ECM is –0.524751 conforming stability in the adjusting process. It shows that 52 per cent of BOP disequilibrium for the previous years shock adjusting towards its long run equilibrium in one year, Our adjusted coefficient for multiple determination R^2 was calculated as 0.660270. This shows that all the variables accounted for 66 per cent of the total variation in BOP. The remaining 34 per cent made be due to other variable(s) not included in the model but captured by the stochastic error term (μ_1). F-statistic calculated is given as 12.98500 and it is greater than F-tabulated of 4.52 at 5 per cent level of significance. That means, the f-ratio is statistically significant. If that is the case, the adjusted coefficient of multiple determination R^2 is significant; consequently, the overall model is significant. The incidence of serial correlation or autocorrelation is tested with Durbin-Watson statistic. The estimated Durbin-Watson statistic is given as 2.642127 at 5 per cent level of significance, the estimated value falls within the region of no autocorrelation.

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5.0 Concluding remarks

The balance of payments position in Nigeria constitutes a structural problem that can hinder the attainment of potential growth. The government should encourage the consumption of locally produced goods in respect to increase income. Equally, the export based policies, such as export promotion and import substitution industrialization policies should be reinvigorated. Finally, since the composition of domestic credit has favoured the public sector for long, a policy of redirecting more credits to the private sector should be encouraged. This research work supported what Fleermuys (2005) summed up that balance of payments is not purely a monetary phenomenon.

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Appendices

Table 4.1Unit Root test using ADF and PP

Variable	**ADF Level**	**First Difference**	**PP Level**	**First Differences**	**Decision**
ΔBOP	3.661187**	-5.600762	-3.610453**	-3.615588	1(0)
DOC	5.383051***	-4.890490	-3.610453***	-2.609066	1(0)
MRR	-2.044702	-8.159572*	-3.610453	-3.615588*	1(1)
ΔL**NEER**	-1.620758	-5.756761**	-2.607932	-2.941145**	1(1)
ΔL**GDP**	-3.66166	-4.869875*	-2.938987	-2.941145**	1(1)

Notes: * Significant at 1%, ** Significant at 5, *** Significant at 10%

Table 4.2Johansen Co-integration Test

Sample (adjusted) 1970 – 2012

Included observations: 43 after adjustment.

Trend assumption: Linear deterministic trend

Series: BOP, LGDP90. LNEER. DOM, MRR

Lags interval (in first difference): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.871560	126.0734	69.81889	0.0000
At most 1 *	0.463605	50.13854	47.85613	0.0300
At most 2	0.345919	27.09183	29.79707	0.0994
At most 3	0.264748	11.38443	15.49471	0.1889
At most 4	0.000146	0.005402	3.841466	0.9407

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.871560	75.93485	33.87687	0.0000
At most 1	0.463605	23.04671	27.58434	0.1715
At most 2	0.345919	15.70740	21.13162	0.2424
At most 3	0.264748	11.37903	14.26460	0.1362
At most 4	0.000146	0.005402	3.841466	0.9407

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

BOP	LGDP90	LNEER	DOM	
3.46E-06	-1.813285	0.057166	1.54E-06	0.060812
-2.15E-06	0.779538	-0.474463	-4.32E-06	-0.121099
-2.44E-07	-12.44444	-0.690982	7.35E-06	0.089218
-1.46E-06	-6.155443	0.448062	7.10E-07	0.336926
-5.08E-07	-7.461224	-0.140141	3.96E-06	-0.097023

Unrestricted Adjustment Coefficients (alpha):

Δ(BOP)	33889.79	196391.9	106241.3	6543.101
Δ(LGDP90)	0.002815	-0.013595	0.025468	0.006996
Δ (LNEER)	-0.210907	-0.181011	0.257858	-0.440039
(DOM)	-.4	-80785.26	-35923.94	8488.421
(MRR)	1.422760	-0.301828	-0483854.47	-0.185843

Source: Auditor's Computation

Table 4.3Over-Parameterized Model

Dependent Variable: ΔBOP

Method: Least Squares

Date: 07/27/1 Time: 16:59

Sample (adjusted): 1970 - 2012

Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3004.334	163027.5	0.018428	0.9854
ΔLNEER	13775.23	64090.23	0.214935	0.8314
ΔLNEER (-1)	37628.25	70322.09	0.535084	0.5968
ΔLGDP90	587183.7	1336890.	0.439216	0.6639
ΔLGDP90 (-1)	521063.7	1208286.	0.431242	0.6696
MRR	-60853.31	24389.88	-2.495023	0.0188
MRR (-1)	63923.25	24381.72	2.621770	0.0140
DOM	-0.371079	0.119926	-3.094240	0.0044
DOM (-1)	0.101961	0.191128	0.533472	0.5979
ECM3 (-1)	-0.474134	0.174945	-2.710182	0.0114

R-squared	0.720368	Mean dependent var	-156626.0
Adjusted R-squared	0.630487	S.D. dependent var	660509.1
S.E. of regression	401507.7	Akaike info criterion	28.86477
Sum squared resid	4.51E+12	Schwarz criterion	29.29572
Log likelihood	-538.4307	Hannan-Quinn criter.	29.01810
F-statistic	8.014636	Durbin-Watson stat	2.487756
Prob(F-statistic)	0.000009		

Source: Author’s Computation

Table 4.4The result of the Parsimonious model

Dependent variable: ΔBOP

Method: Least Squares

Sample (adjusted): 1970-2012

Included observations: 43 after adjustment

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9747.186	154785.9	0.062972	0.9502
ΔLNEER(-1)	35887.46	66611.42	0.538758	0.5939
ΔLGDP90	723878.9	1255440.	0.576594	0.5684
MRR	-64828.71	22624.94	-2.865365	0.0074
MRR(-1)	69453.40	22098.27	3.142934	0.0037
DOM	-0.309542	0.043133	-7.176428	0.0000
ECM3(-1)	-0.524751	0.152840	-2.779052	0.0092

R-squared	0.715361	Mean dependent var	-156626.0
Adjusted R-squared	0.660270	S.D. dependent var	660509.1
S.E. of regression	384986.7	Akaike info criterion	28.72463
Sum squared resid	4.59E+12	Schwarz criterion	29.02629
Log likelihood	-538.7679	Hannan-Quinn criter.	28.83196
F-statistic	12.98500	Durbin-Watson stat	2.642127
Prob(F-statistic)	0.000000		

Source: Author’s Computation